



## Department of Chemistry Seminar Series Fall 2022

Friday, October 21, 2022, 3:30 PM - **HS1 O112 (Health Sciences)**

Host: Lei Zhai

### Fabrication of Nanoparticles on Carbonaceous Nanofibers

**Alex Burnstine-Townley**

**Advisor: Prof. Lei Zhai**

Department of Chemistry and Nanoscience Technology Center  
University of Central Florida

Supported nanoparticle electrodes are used as catalysts and present an efficient technology for pollutant decomposition. Current methods typically require harsh chemical reagents or high energy pyrolysis to strongly adhere nanoparticles to a support. Rapid Joule heating has emerged as a valuable, energy-efficient technique to produce well-dispersed nanoparticle catalysts on various supports. We present a liquid-assisted microwave heating method to improve nanoparticle homogeneity and dispersion on carbon nanofibers under ambient atmosphere with simple sample preparation. Carbon nanofibers play an essential role as microwave absorber and subsequent source of rapid heating, while demonstrating fast cooling thanks to its low dimensionality. The method exhibits rapid evaporation of solvent microdroplets and subsequent metal salt decomposition to afford small nanoparticles in seconds using a conventional microwave source. The presence of a phase-separated liquid system imparts self-regulation of metal salt concentration to curtail formation of nanoparticle aggregates. Nickel, cobalt, and copper nanoparticles are produced on the fibers using the proposed method, while characterization is focused on observing nanoparticle morphology, shape and size based on solvent type and precursor concentration. The method is used to produce binder-free nanoparticle composite electrodes for catalysis, as well as explore the fabrication of high entropy alloy and single atom alloy catalysts.